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| 10/593,137 | 09/18/2006 | Hikaru Okubo | 033036.110 | 6494 |
| 441 7590 08/24/2010 SMITH, GAMBRELL & RUSSELL 1130 CONNECTICUT AVENUE, N.W., SUITE 1130 WASHINGTON, DC 20036 | | | | |
| EXAMINER | | | | |
| FINK, BRIEANN R | | | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/593,137

Applicant(s)

OKUBO ET AL.

Examiner

Briann R. Fink

Art Unit

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 July 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) 1-13, 15-22 and 26-41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 14 and 23-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 7, 2010 has been entered.
2. Claims 14 and 23 have been amended. Claims 14 and 23-25 are currently pending and under examination.
3. All previous rejections are withdrawn.
4. The texts of those sections of Title 35 U.S. Code are not included in this section and can be found in a prior Office action.

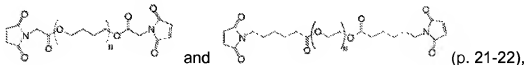
Claim Rejections - 35 USC § 103

5. Claims 14 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Herr* (US 6,265,530) in view of *Sakurai* (JP 2003-040939). However, for convenience, the machine translated English equivalent will be cited below.

Herr teaches an adhesive for use in semiconductors which comprise a maleimide compound, a vinyl compound, a curing initiator, and optionally, a filler (col. 1, ll. 43-49).

Herr teaches the maleimide compounds to have a structure represented by $[M-X_m]_n-Q$. *M* is a maleimide moiety. When m is 0, n is 2, and *Q* is an ester of $-R^3-C(O)O-R^3-O(CO)-R^3-$, and R^3 is an alkyl or alkyloxy, the bis-maleimides are similar to those of the instant invention; however, *Herr* fails to explicitly teach the claimed bismaleimides, when the 'middle' R^3 is that of a polyether.

Sakurai teaches adhesives which are prepared without a photopolymerization initiator which do not yellow in the presence of sunlight, do not crack due to further progression of a photoinitiator and are capable of incorporating low amounts of maleimide derivative while maintaining a high degree of crosslinking (p. 3, [0009] and p. 19, [0108]). *Sakurai* teaches the maleimide derivatives to include



both of which fall within applicants' claimed maleimides.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the maleimide derivatives of *Sakurai* in the adhesives of *Herr* as they are taught to allow for a high degree of crosslinking without cracking and yellowing of the hardened composition.

As to the vinyl compounds, *Herr* discloses them as having the structure $[R_1-CH=CHR_2-B-X_m]_n-Q$. When R_1 and R_2 are H, *B* is C, m is 0, n is 2, and *Q* is $-R_3-OC(O)-R_3-(CO)O-R_3-[-OC(O)-R_3-(CO)O-R_3-]_p-$, and R_3 can be

independently an alkyl or alkyloxy group, the compound (D) and allyl esters of (G) are obtained.

Herr teaches the curing initiator to be that of a free-radical initiator, such as peroxides, including dicumyl peroxide (col. 2, ll. 44-16). Note this is the same initiator used in the examples of the instant invention (see instant specification, Examples E1-E3, p. 67). *Sakurai* also teaches the inclusion of a thermal initiator, specifically peroxides (p. 16, [0085]).

Herr teaches the fillers to include silver, as well as copper, gold, silica and alumina (col. 3, ll. 14-18).

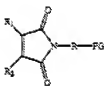
6. Claims 14 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Herr* (US 6,265,530) in view of *Hoyle* (US 6,034,150).

Herr teaches an adhesive for use in semiconductors which comprise a maleimide compound, a vinyl compound, a curing initiator, and optionally, a filler (col. 1, ll. 43-49). *Herr* teaches the curing initiator to be that of a free-radical initiator, such as peroxides, including dicumyl peroxide (col. 2, ll. 44-16). *Herr* teaches the fillers to include silver, as well as copper, gold, silica and alumina (col. 3, ll. 14-18).

Herr teaches the maleimide compounds to have a structure represented by $[M-X_m]_n-Q$. M is a maleimide moiety. When m is 0, n is 2, and Q is an ester of $-R^3-C(O)O-R^3-OC(O)-R^3-$, and R^3 can be an alkyl or alkyloxy, the bis-maleimides

are similar to those of the instant invention; however, *Herr* fails to explicitly teach the claimed bismaleimides, when the 'middle' R^3 is that of a polyether.

Hoyle teaches maleimide compounds which can be used in place of photoinitiators which can eliminate problems associated with residual photoinitiator in the cured product, which include decreased light fastness, discoloration, and lower resistance to oxidative degradation, as substantially all of the maleimide is consumed during initiation and polymerization (col. 1). *Hoyle* teaches the maleimides to include those having the formula



, where R is C1 to C10 alkyl, then FG is a functional group such as $-C(O)OR_3$, in combination with a spacer group linking the maleimide unit with at least one other maleimide unit to form a difunctional maleimide unit. Exemplary spacer groups include C1 to C10 oxyalkyl groups, such as ethylene glycol. (col. 3-4). For example, *Hoyle* exemplifies triethylene glycol biscarbonate bisethylmaleimide. Substituting the $OC(O)O$ for $C(O)O$ results in a maleimide compound which meets the instantly claimed compounds.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the bismaleimides of *Hoyle* in the semiconductor adhesive of *Herr* as they are taught to replace photoinitiators and give cured products exhibiting minimal degradation (as evidenced by yellowing and increasing brittleness) (col. 8, ll. 21-38).

Note *Herr* teaches an alternative of incorporating both thermal and photo-initiators. Using the maleimides of *Hoyle* would motivate one of ordinary skill in the art to not use a photoinitiator.

As to the vinyl compounds, *Herr* teaches them as having the structure $[R_1-CH=CHR_2-B-X_m]_n-Q$. When R_1 and R_2 are H, B is C, m is 0, n is 2, and Q is $-R_3-OC(O)-R_3-(CO)O-R_3-[-OC(O)-R_3-(CO)O-R_3-]_p-$, and R_3 can be independently an alkyl or alkoxy group, the compound (D) and allyl esters of (G) are obtained as the repeating groups of instant claim 14 and 25 are only required to be present once (i.e. when p and $s=1$).

Response to Arguments

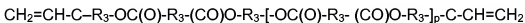
7. Applicant's arguments filed July 7, 2010 have been fully considered but they are not persuasive.

Applicants argue that *Herr* fails to teach any of the compounds (B) the maleimides, (D), or (G) the allyl esters.

As to the maleimides: *Herr* teaches $[M-X_m]_n-Q$. M is a maleimide moiety. m is 0, n is 2, and Q is an ester of $-R^3-C(O)O-R^3-OC(O)-R^3-$, and R^3 can be an alkyl or alkoxy. This gives M-alkyl-C(O)O-alkoxy-OC(O)-alkyl-M. An alkoxy is known in the art at O-R; however, one of ordinary skill in the art knows that this would not result in a stable compound nor does *Herr* suggest the compounds as peroxides. Further, one of ordinary skill in the art would know to introduce an alkyl group with the alkoxy, M-alkyl-C(O)O-alkyl-O-R-OC(O)-alkyl-M to prepare a

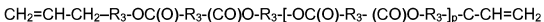
stable compound; however, one of ordinary skill in the art would have been motivated to prepare compounds (B) in view of *Sakurai* OR *Hoyle*, as in the rejections above.

As to compound (D), *Herr* teaches them as having the structure $[R_1-CH=CR_2-B-X_m]_n-Q$. When R_1 and R_2 are H, B is $C(H_2)$, m is 0, n is 2, and Q is $-R_3-OC(O)-R_3-(CO)O-R_3-[-OC(O)-R_3-(CO)O-R_3-]_p-$, and R_3 can be independently an alkyl or alkyloxy group. This gives the following:



and R_3 can be independently an alkyl or alkyloxy group. *Herr* claims the compounds (D) as having an unsaturated polymerizable functional group, $CH_2=CH-$, and $-(X^3-R^7-)_p-$, where X^3 is $-O-$, $-COO-$ or $-OCOO-$ and R^7 is a hydrocarbon, and p is between 1 and 50. The above compound of *Herr* satisfies the instant invention with the functionality $OC(O)-R_3-$, as p can be 1.

As to compound (G), *Herr* teaches



The functionality $CH_2=CH-CH_2-OC(O)-R_3-$ meets the allyl ester. *Herr* does not teach the inclusion of aromatic compounds in the allyl esters. As to claim 25, the instant invention desires a functional group presenting the allyl ester which is claimed as $-(X^5-R^{13}-)_s-$, where X^5 is $-O-$, $-COO-$ or $-OCOO-$ and R^{13} is a hydrocarbon, and s is between 1 and 50. The above compound of *Herr* satisfies the allyl ester with the functionality $(CO)O-R_3-$, as s can be 1.

Note the connecting site to B can be an alkyl, such as methyl, CH₂ which meets then claimed compounds.

The previously submitted Rule 132 Declaration does not overcome the currently proposed rejections as *Herr* in view of *Sakurai* OR *Hoyle* are *prima facie* obvious over the instant invention and the Declaration only shows the importance of the presence of the bismaleimide or the allyl ester. The presence of the bismaleimide is necessary in all of *Herr*, *Sakurai*, and *Hoyle* as it teaches improvements in discoloration and cracking or degradation. The presence of the allyl ester is suggested by *Herr*.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 7,576,139 teaches the instant invention; however, is not considered prior art under 35 U.S.C. 102.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Briann R. Fink whose telephone number is (571)270-7344. The examiner can normally be reached on Monday through Friday, 7:00 AM to 4:30 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton I. Cano can be reached on (571)272-1398. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Milton I. Cano/
Supervisory Patent Examiner, Art Unit 1796

/Brieann R Fink/
Examiner, Art Unit 1796